1   CLAIMS

2   We claim:

3   1. A method comprising providing hierarchical management of at least one domain for an entity,

4   said step of providing hierarchical management comprising:

5   obtaining a hierarchical representation of said at least one domain, said representation

6   *comprising*including: a list of computing environments to be managed, at least one policy

7   controlling acquisition of at least one resource from resource libraries for said at least one

8   domain, and any sub-domains within said at least one domain; and

9   instantiating the representation.

10   2. A method as recited in claim 1, further comprising *at least one step taken from a group of*

11   *steps consisting of*::

12   deriving a set of resources required for said list of computing environments in

13   constructing said hierarchical management, ,and

14   providing resources for said set of resources to said at least one domain,-

15   3. A method as recited in claim 1, further comprising updating said at least one policy of the

16   representation,

17   4. A method as recited in claim 1, further comprising utilizing library services,;

18   *utilizing library services wherein both the quantity and types of base resources change over time.*

19   5. A method as recited in claim 1, further comprising associating each computing environment

20   with a particular sub-domain,.

6. A method as recited in claim 4, wherein the step of utilizing includes reserving a set of resources required by said list of computing environments;

associating at least one library service from said library services with at least one collector;

and.

7. A method as recited in claim 6, further comprising acquiring the set of resources and using at least one resource from said set of resources.

*3*8. A method as recited in claim 1, *further comprising at least one limitation taken from a group of limitations consisting of:*:

wherein said at least one domain is a plurality of domains.;

9. A method as recited in claim 8, wherein at least one domain from said at least one domain is a sub domain of another domain.;

10. A method as recited in claim 9, wherein at least one of said at least one domain is a root domain.;

11. A method as recited in claim 4, further comprising associating at least one library service from said library services with at least one collector.

12. A method as recited in claim 4, wherein both the quantity and types of base resources change over time.

4. A method as recited in claim 1, further comprising:

deriving a set of resources required for said list of computing environments in constructing said

1   *hierarchical management ;*

2   *providing resources for said set of resources to said at least one domain;*

3   *updating said at least one policy of the representation;*

4   *utilizing library services wherein both the quantity and types of base resources change over time.*
5   *associating each computing environment with a particular sub-domain;.*

6   *reserving a set of resources required by said list of computing environments;*

7   *associating at least one library service from said library services with at least one collector; and*

8   *acquiring the set of resources and using at least one resource from said set of resources.*

9   *5. A method as recited in claim 1, wherein:*

10 *said at least one domain is a plurality of domains;*

11 *at least one domain from said at least one domain is a sub domain of another domain; and*

12 *at least one of said at least one domain is a root domain;*

13 13. An article of manufacture comprising a computer usable medium having computer readable
14 program code means embodied therein for causing provision of hierarchical management of at
15 least one domain for a computing utility, the computer readable program code means in said
16 article of manufacture comprising computer readable program code means for causing a
17 computer to effect the steps of claim 1.

18 14. A program storage device readable by machine, tangibly embodying a program of

1   instructions executable by the machine to perform method steps for providing hierarchical

2   management of at least one domain for a computing utility, said method steps comprising the

3   steps of claim 1.

4   15. An apparatus comprising means for providing hierarchical management of at least one

5   domain for a computing utility, said means for providing hierarchical management comprising:

6   means for obtaining a hierarchical representation of said at least one domain, said

7   representation including: a list of computing environments to be managed, at least one policy

8   controlling acquisition of at least one resource from composite resources for said at least one

9   domain, and any sub-domains within said at least one domain; and

10   means for instantiating the representation.

11   16. A computer program product comprising a computer usable medium having computer

12   readable program code means embodied therein for causing provision of hierarchical

13   management of at least one domain for a computing utility, the computer readable program code

14   means in said computer program product comprising computer readable program code means for

15   causing a computer to effect the functions of claim 15.

16   17. A method comprising: creating a hierarchical representation of an entity comprising

17   organizing the entity into a domain tree of domains, wherein each domain represents an

18   organization within the entity, said each domain obtains computing environments and resources

19   from a computing utility.

20   18. A method as recited in claim 17, further comprising:

21   determining computing environments to be associated with each domain;

22   determining an acquisition policy and a distribution policy for each domain;

1   converting the domain tree into a collector hierarchy; and

2   connecting said collector hierarchy into a hosted root collector for a hosted environment.

3   19. A method as recited in claim 18, further comprising using said hosted environment to

4   provision at least one computing environment and at least one resource to said entity.

5   20. A method as recited in claim 18, wherein the step of connecting is performed by a service

6   provider.

7   21. A method as recited in claim 18, wherein the step of connecting includes connecting

8   collector hierarchies for a plurality of customers of the hosted environment into the hosted root

9   collector.

10   22. A method as recited in claim 18, wherein the step of converting includes

11   inserting a collector as a hierarchy root collector of the collector hierarchy,

12   determining a number of computing environments of the root domain of the domain tree sand

13   whether a sub domain of a root domain of the domain tree exist,

14   if there is only one computing environment and no sub domains of a root domain of the

15   domain tree, inserting a PMRS in the collector hierarchy and terminating the step of

16   converting,

17   otherwise, for each computing environment of said root domain of the domain tree,

18   adding a collector and PMRS to the root collector of said collector hierarchy;

19   determining sub domains of said root domain of the domain tree that have only one computing

1   environment:

2   for each sub domain of said root domain of the domain tree that has only one computing

3   environment and no other sub domain, inserting a PMRS into the collector hierarchy,

4   for each sub domain of said root domain of the domain tree that has more than one

5   computing environment or other sub domains, placing said each sub domain on a domain

6   processing list; and

7   repeating the step of inserting a collector, the step of determining a number of computing

8   environments for each domain on the domain processing list as if it were a root domain, and the

9   step of determining sub domains of said root domain of the domain tree that have only one

10   computing environment, until said domain processing list is empty.

11   23. A method as recited in claim 18, wherein the step of connecting is performed by a service

12   provider.

13   24. A method as recited in claim 1, wherein said method is employed in providing service

14   on-demand.

15   25. An article of manufacture comprising a computer usable medium having computer readable

16   program code means embodied therein for causing creation of a hierarchical representation of an

17   entity, the computer readable program code means in said article of manufacture comprising

18   computer readable program code means for causing a computer to effect the steps of claim 17.

19   26. A program storage device readable by machine, tangibly embodying a program of

20   instructions executable by the machine to perform method steps for creating a hierarchical

21   representation of an entity, said method steps comprising the steps of claim 17.

22   27. An apparatus comprising:

1   means for creating a hierarchical representation of an entity comprising means for organizing the

2   entity into a domain tree of domains, wherein each domain represents an organization within the

3   entity, said each domain obtains computing environments and resources from a computing utility.

4   28. A computer program product comprising a computer usable medium having computer

5   readable program code means embodied therein for causing creation of a hierarchical

6   representation of an entity, the computer readable program code means in said computer program

7   product comprising computer readable program code means for causing a computer to effect the

8   functions of claim 27.

9   29. An apparatus comprising a plurality of collectors to represent a plurality of domains in a

10   computing utility, each of said collectors being linked to at least one other collector, each

11   collector having:

12   a controller to control reserved resources for each domain;

13   a policy advisor to interpret any policy; and

14   a resource manager to manage resource acquisition for computing environments.

15   30. An apparatus as recited in claim 29, said apparatus further comprising at least one base

16   resource library service, at least one collector is associated with at least one of said at least one

17   base resource library service, said base resource library service having a Resource Operations

18   interface and a Catalog interface.

19   31. An apparatus as recited in claim 30, wherein said at least one base resource library service

20   includes at least one public Base Resource Library Service to provide library services to at least

21   one domain, said public base resource library service having a Resource Operations interface and

22   a Catalog interface.

1   32. An apparatus as recited in claim 29, wherein said Resource operations interface provides an

2   operation taken form a group of operations consisting of: Reserve, CancelReservation, CheckIn,

3   CheckOut, Query, Update; and any combination of these operations.

4   33. An apparatus as recited in claim 29, wherein said Catalog operations interface provides an

5   operation taken form a group of operations consisting of: Reserve, Add, Remove, Update, Query,

6   and any combination of these operations.

7   34. A method as recited in claim 10, further comprising

8   a requesting computing environment making a request for a particular combination of resources

9   checking said representation of the acquisition policy of said requesting computing environment

10   to verify that satisfaction of the request for the particular of resources is within the acquisition

11   policy of said requesting computing environment; and

12   repeating the step of checking for all parent collector of said requesting collector until any root

13   collector is reached.

14   35. A method as recited in claim 34, further comprising determining if the acquisition policy is

15   satisfied all the way to any root collector;

16   if the acquisition policy is satisfied the request is granted otherwise the request is denied.

17   36. A method as recited in claim 10, further comprising

18   making a request for a particular combination of resources;

19   determining a starting collector to start a search for the combination of resources;

1   checking if the starting collector has at least one resource from said combination of resources,

2   said at least one resource being a located resource;

3   checking if there is at least one library which includes at least one resource from said

4   combination of resources, said at least one resource being a located resource;

5   repeating the step of checking at each collector from a starting collector to any root collector;

6   if all resources of said combination are located resources reserving all located resources,

7   otherwise denying the request.

8   37. A method as recited in claim 36, further comprising calling arbitration to continue locating

9   all resources from said combination of resources.

10   38. A method as recited in claim 1, wherein said at least one resource is a base or composite

11   resource.

12   39. A method as recited in claim 1, further comprising organizing said at least one resource into a

13   service offered to a plurality of customers.

14   40. A method as recited in claim 1, further comprising allocating base resources to a library

15   service.

16   41. A method as recited in claim 40, further comprising formulating composite resources from

17   base resources satisfying a service description.

18   42. A method as recited in claim 1, further comprising allocating composite resources to a

19   library service.

1   43. A method as recited in claim 1, further comprising allocating services to a library service.

2   44. An architecture for a computing utility comprising an apparatus to provide at least one

3   service for a plurality of clients, said apparatus comprising:

4   a Base Resource Distribution Service to allocate resources to said at least one service;

5   said Base Resource Distribution Service having at least one collector;

6   at least one Provisioned and Managed Resource Service coupled to said Base Resource

7   Distribution Service to provision and manage said resources for said at least one service; and

8   at least one Base Resource Library Service coupled to said Base Resource Distribution

9   Service to provide reservation and allocation of resources.

10   45. An architecture as recited in claim 44, wherein said Base Resource Distribution Service

11   comprises:

12   at least one collector, each collector anchoring a representation of a particular domain and

13   holds polices of said particular domain and holds resources reserved for said particular domain;,

14   and

15   an arbiter coupled to said base resource distribution service and available to each of said

16   collectors, said arbiter provides dynamic resource allocation to each collector of said computing

17   utility.

18   46. An architecture as recited in claim 44, wherein the architecture is used by an on-demand

19   service.

20   47. A computer program product comprising a computer usable medium having computer

21   readable program code means embodied therein for controlling and managing resources, the

1   computer readable program code means in said computer program product comprising computer

2   readable program code means for causing a computer to effect the functions of claim as in 29.